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NOTES ON AMERICAN WILLOWS. VIII

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a. THE SPECIES OF THE SECTION CHRYSANTHEAE

THIS study of the species of section *Chrysantheae* is based on the same material as mentioned on p. 67 of this Journal and I wish to express my best thanks to the gentlemen in charge of these collections, and also to Professor J. K. Henry, Vancouver, and to Mr. J. C. Nelson, Salem, Oregon.

I am not sure whether the following species should be combined in one section, nor am I convinced that *Chrysantheae* is the correct name for such a section. It has been proposed by Koch for a group containing a single species: *S. lanata* Linnaeus. This is a very well marked species of northern Europe and Asia but is not found in the New World.¹ I believe, however, that species like *S. Richardsonii* Hooker are rather closely related to it. I place, therefore, this American species and the related *S. calcicola* Fernald and *S. Barrattiana* Hooker in this section. Andersson did the same in 1868, uniting *S. lanata*, *S. Richardsonii* and *S. Barrattiana* into a subsection *Lanatae* of his section "*Niveae* s. *Glaucæ*." He cites Koch's name *Chrysantheae* (!) as a synonym. Andersson also added *S. Hookeriana* Barratt to the same subsection; he placed, however, *S. speciosa* Hooker & Arnott (now *S. alaxensis* Coville) in a second subsection B. *Villosae*. This last subsection contains, besides some European species and a number of hybrids the American *S. candida* Flügge. The affinity of the Hoary Willow is by no means certain. Köhne (1893) referred it with *S. Elaeagnos* Scopoli (*S. incana* Schrank) to section *Incanae* Andersson while Ball (1909) placed it near *S. brachycarpa* Nuttall in his section *Arcticae*. I shall deal with *S. candida* later as I regard it a representative of a special group.

As to the affinity of *S. Hookeriana* I can only state that it might be taken for a distinct type which combined with *S. Piperi* Bebb, *S. amplifolia* Coville, *S. alaxensis* Coville and *S. laurentiana* Fernald may form a separate section. I think it best, however, at present to place all these species in the same group with *S. Richardsonii* and *S. Barrattiana*. A closer study

¹ Lange, Consp. Fl. Groenl. II. 28 (1887), cites: "221. *S. lanata* (chrysanthos) L. V. Gr.: Narsarsuk- og Kvanefjord ved Godthaab (Raben)." He adds however the following note: "Obs. Specimina in his locis lecta in herbariis desunt, quare incertum videtur, an recte determinata sit."

of these species probably will elucidate more distinctly the true relationship between them. Of *S. laurentiana* the male plant is not yet known. The color of the anthers of all the species seems to be yellow with the possible exception of *S. alaxensis* of which the young anthers may be violet. The filaments are glabrous and free, sometimes, however, slightly pilose at their base and somewhat united. I cannot yet state whether there are some forms which always show a few hairs at the base of the filaments.

The main difference of the species with which I am here dealing can be taken from the keys. As to the synonymy of the section the following is to be said.

Section *Chrysantheae* Koch, *Salic. Europ. Com.* 11 (1828). — Sect. *Chrysanthos* Fries, *Novit. Fl. Suec. Mant.* i. 37 (*Com. Salic.*) (1832). — Sect. *Cinereae* Barratt apud Hooker, *Fl. Bor.-Am.* ii. 144 (1838), pro parte. — Sect. *Discolores* Barratt, l. c. 147 (1838), pro parte. — Sect. *Arcticae* vel *Subarcticae* Andersson in *Öfv. Svensk. Vet.-Akad. Förh.* xv. 119 (1858), pro parte maxima. — Sect. *Niveae* s. *Glaucæ* [subsect.] A. *Lanatae* Andersson in De Candolle, *Prodr.* xvi.² 275 (1868), pro parte. — Sect. *Lanatae* Köhne, *Deutsche Dendr.* 94 (1893) — Ball apud Coulter & Nelson, *New Man. Rocky Mts. Bot.* 135 (1909). — Sect. *Lanatae*, subsect. *Chrysantheae* Schneider, *Ill. Handb. Laubh.* i. 47 (1904). — Sect. *Argentea* Rydberg, *Fl. Rocky Mts.* 189 (1917), pro parte.

CLAVIS SPECIERUM VARIETATUMQUE

A. SECUNDUM SPECIMINA FEMINEA

Ovaria et pedicelli glabri.

Amenta etiam fructifera sessilia; pedicelli nulli, subnulli vel in *S. Barrattiana* var.

Tweedyi ad 1 mm. longi; styli 1.5 ad 2.5 mm. longi; ramuli novelli dense hirsuto-villosi vel lanuginosi; stipulae distinctae, persistentes.

Stipulae lineari- ad semicordato-lanceolatae, apice plus minusve acuminatae, ad 1-2.5 cm. longae, in surculis saepe latiores et lobulatae, margine glanduloso-serrato-dentatae. 1. *S. Richardsonii*.

Stipulae semicordatae ad semiorbiculares vel reniformes, margine dense glanduliferae.

Petioli brevissimi, vix ultra 4 mm. longi; folia majora superiora late ovata ad orbicularia, basi pleraque cordata, apice obtusa vel leviter acutata, margine fere semper integerrima; amenta fructifera ad 6-8.5: 1.2-1.8 cm. magna; fructus ad 6 mm. longi, ovoideo- vel elliptico-conici, subrostrati.

2. *S. calcicola*.

Petioli 8-15 mm. longi; folia majora superiora elliptica vel ovalia, basi acuta ad subobtusa, margine plus minusve glanduloso-subspinuloso-denticulata.

3. *S. Barrattiana* var. *Tweedyi*.

Amenta pedunculo distincto foliolato suffulta, vel breviter pedunculata (saltem fructifera) et pedicelli 1-2 mm. et styli vix ultra 1.3 mm. longi; stipulae nullae vel etiam in ramulis vegetioribus parvae, caducae.

Ramuli novelli hornotinique plus minusve dense tomentosi.

Styli 2-2.5 mm. longi; amenta distincte pedunculata (pedunculo 2-4-foliolato ad 1.5 vel interdum ad 2 cm. longo) 4. *S. amplifolia*.

Styli 1-1.3 mm. longi; amenta sessilia, pedunculo ad 5 mm. longo foliola 3-5 parva gerente suffulta.

- Folia etiam adulta subtus dense argenteo-lanato-tomentosa, supra obscure viridia 5. *S. Hookeriana* var. *typica*.
- Folia adulta subtus glabra vel plus minusve pubescentia, glaucescentia, supra subnitida. 5a. *S. Hookeriana* var. *laurifolia*.
- Ramuli novelli tantum sparse pilosi vel laxe villosuli, cito glaberrimi; styli 1-1.3 mm. longi; amenta subsessilia vel breviter pedunculata . . . 6. *S. Piperi*.
- Ovaria et pedicelli (vel in *S. Richardsonii* interdum tantum pedicelli) pilosi.
- Styli tantum 1-1.2 mm. longi; amenta subsessilia vel pedunculata (confer etiam *S. Piperi*).
- Fructus 7-9 mm. longi; stipulae nullae; folia subtus satis dense tomentosa, supra obscure viridia 5. *S. Hookerianae* var. *tomentosa*.
- Fructus 6-7 mm. longi; stipulae semicordatae ad 10 mm. longae, caducae; folia subtus glabrescentia, glaucescentia, supra lucido-viridia. 7. *S. laurentiana*.
- Styli 1.2-2.5 mm. longi; amenta sessilia vel subsessilia.
- Stipulae lineari-lanceolatae ad filiformes, ad 22:2 mm. magnae, margine distanter glandulosae, subtus ut pagina inferior foliorum tomento densissimo albo vel flavescenti opaco molli vestita.
- Ramuli novelli hornotinique dense tomentosi, etiam biennes nunquam pruinosi 8. *S. alaxensis* var. *typica*.
- Ramuli novelli laxius vel sparse villosi, annotini glabri et ut etiam biennes saepissime pruinosi 8b. *S. alaxensis* var. *longistylis*.
- Stipulae semicordato-lanceolatae ad semicordatae, ad 8 mm. longae, margine intusque dense glanduliferae (balsameae), glabriusculae. 3. *S. Barrattiana*.

B. SECUNDUM SPECIMINA MASCULA

(in *S. laurentiana* ignota)

- Ramuli novelli laxe vel sparse villosi, annotini glabri.
- Bracteae ovato-oblongae, acutae vel subacuminatae; filamenta libera, glabra; antherae ut videtur initio violaceae; ramuli annotini plus minusve pruinosi. 8b. *S. alaxensis* var. *longistylis*.
- Bracteae obovatae, apice plus minusve rotundatae; filamenta libera vel subcoacta, glabra vel basi parce pilosa; antherae aureae, ramuli annotini atropurpurei, epruinosi 6. *S. Piperi*.
- Ramuli novelli annotinique (et saepe biennes) distincte tomentosi, villosi vel subhirsuti.
- Amenta subsessilia vel distincte pedunculata; filamenta interdum basi parce pilosa; stipulae nullae (vel in ramulis vegetioribus parvae caducae).
- Pedunculi distincte foliolati, ad 1.5-2 mm. longi; folia adulta subtus tantum in costa tomentosa 4. *S. amplifolia*.
- Pedunculi subnulli vel vix ultra 5 mm. longi, foliolis minimis instructi; folia etiam adulta subtus in facie villosa-tomentosa (sed confer etiam var. *laurifolia*) 5. *S. Hookeriana*.
- Amenta sessilia; filamenta libera, glabra; stipulae distinctae.
- Stipulae lineares ad semicordato-lanceolatae.
- Folia subtus tomento densissimo albo vel flavescenti opaco molli vestita. 8. *S. alaxensis*.
- Folia adulta glaberrima 1. *S. Richardsonii*.
- Stipulae semicordatae ad semiorbiculares vel reniformes.
- Petioli 8-15 mm. longi.
- Folia subtus etiam adulta villosula. 3. *S. Barrattiana*.
- Folia subtus glabrescentia. 3. *S. Barrattiana* var. *Tweedyi*.
- Petioli vix ultra 4 mm. longi. 4. *S. calcicola*.

ENUMERATIO SPECIERUM

1. *S. Richardsonii* Hooker, Fl. Bor.-Am. II. 147, t. 182 (1839).— Andersson in De Candolle, Prodr. XVI.² 273 (1868), incl. var. *latifolia* et *angustifolia*. — Seemann, Bot. Voy. Herald, 40 (Fl. West-Eskim.-Land) (1852-57). — Bebb in Bot. Gaz. XVI. 50 (1889), ex parte. — Coville in Proc. Wash. Acad. Sci. II. 315, fig. 19 (1901). — Ostenfeld in Vid.-Selsk. Skrift. I. Math.-Nat. Kl. 1909, no. 8, 35 (Vasc. Pl. Arct. N. Am. Gjöa Exp.) (1910). — *S. (lanata) americana* b. *Richardsoni* Andersson in Öfv. Svensk. Vet.-Akad. Förh. XV. 119 (1858); in Walpers, Ann. Bot. v. 747 (858). — *S. lanata*, var. *americana* forma β . *S. Richardsoni* Andersson in Proc. Am. Acad. VI. 59 (Sal. Bor.-Am. 13) (1858). — *S. lanata americana* Andersson in De Candolle, Prodr. XVI.² 274 (1868), pro synonym. — In 1889, Bebb, and in 1901 Coville already dealt with this interesting Arctic species the type of which was collected by Dr. Richardson at Fort Franklin on the Mackenzie River. I have seen a photograph and fragments of the female type preserved in Herb. Kew. Hooker did not know the male plant, but Richardson also collected specimens with staminate aments as Bebb has already pointed out. Bebb, however, referred to *S. Richardsonii* a specimen from Labrador which belongs to *S. calcicola*.

The leaves of *S. Richardsonii* are not entire as Hooker stated. On his own plate he clearly shows a denticulate base of a leaf. Sometimes the leaves are even rather distinctly denticulate as in Eastwood's no. 385 and in Chapman's 41a.

The geographical distribution of this species is clearly indicated by the specimens enumerated below. There are two specimens which I am not able to identify correctly. One was collected by J. Macoun on Hunker Creek in the Yukon Territory, July 24, 1902 (No. 54396, O.; fr. im.; G., N., W.). It had been named *S. Lyallii* (Sarg.) Heller?, and by Rydberg *S. Barclayi*. The fruiting aments are quite like those of *S. Richardsonii* but the pedicels are as long as the gland. The young twigs are rather yellowish and partly glabrescent, and the older branchlets are more like those of *S. Richardsonii* with a looser pubescence. The leaves and stipules do not differ from those of this species, and it may be only a form of it, or a hybrid from it. The second doubtful specimen was brought by F. Johansen from Bernard Harbour, August 7, 1915 (No. 308 b = 93781, O.; f., fr.; "a bush"). On this specimen the ovaries are partly sparsely pilose but the fruits are glabrous. I presume that *S. Richardsonii* also has a form with more or less hairy ovaries as this occurs in certain groups in almost every species with glabrous pistils.

Andersson, in 1868, described two forms: *latifolia* and *angustifolia*. I do not think that they are of any taxonomic value because both forms of leaves are to be found on the same plant.

As Ostenfeld has already pointed out, the most prominent characters of this Willow are: "the stout hairy young twigs, the large persistent glandular-serrate stipules, and the smooth leaves with at the base sparingly glan-

dular-denticulate margins." In some respect this species seems to be closely related to *S. pulchra* Chamisso with which I have dealt on p. 70 of this Journal, and to which var. *yukonensis* is rather similar. I also stated, on p. 73, that the systematic position of *S. pulchra* is by no means clear to me. The species most nearly related to *S. Richardsonii* is *S. calcicola*, the representative of that western Willow in eastern Canada.

The following specimens of typical *S. Richardsonii* have been seen:

ALASKA. Camden Bay, Collinson Point, June 15, 1914, *F. Johansen* (No. 6 c. = 93795, O.; f. fragm.; No. 100, 33803, O.; f.; dwarf Arctic form); Anvik (on Yukon River, southeast of Norton Sound), April, *J. W. Chapman* (No. 41a, 41b, m.; G.; folia juvenilia satis dense glanduloso-denticulata); Seward Peninsula, Teller, June 21, 1916, *Ella Gehrman* (f.; C.); between Cape Nome and Port Clarence, June, 1901, *A. J. Collier* (m., f.; W.); near Nome, June 21, 1903, *F. L. Hess* (No. 8a, m.; St.; "dry creek, 1 mile north of Nome, tundra along creek bottom, plentiful," 0.9 to 1.2 m.); tundra behind Nome, along water courses, June 17, 1903, same coll. (No. 2, m.; St.; "2-3 feet high"); Porcupine River, without exact locality, summer 1891, *J. W. Turner* (No. 1, m.; Jeps.); vicinity of Port Clarence, on Rocky banks, northwest shore of Imuruk Basin, July 30, 1891, *F. A. Walpole* (Nos. 1626, 1627, fr.; W.); at Teller Reindeer Station, on tundra, July 14, 1901, same coll. (No. 1441 m.; July 13, 1901, No. 1403, f.; 1426, f.; m.; W.); meadows at east end of Grantley Harbour, July 30, 1901, same coll. (No. 1601, fr.; W.); banks of tundra near Beach at Teller Reindeer station, August 7, 1901, same coll. (No. 1771, fr.; W.); banks north side of Grantley Harbour, August 5, 1901, same coll. (No. 1753, fr.; W.); East Fork of John River at camp, July 16-17, 1901, *F. C. Schrader* (st.; W.), southeastern Alaska, Glacier W. P. & Y. R. R., June 9, 1900, *F. A. Walpole* (No. 1069, m.; W.).

NORTHWESTERN BRITISH COLUMBIA. Between Log Cabin and Frasier, June 7, 1900, *F. A. Walpole* (No. 1062, m., f.; W.).

YUKON TERRITORY. Selkirk Trail, September 6, 1898, *J. B. Tyrrell* (No. 19450, O.; st.); Carcross (Caribou Crossing), on shores of Lake Bennett near bridge, July 26, 1914, *A. Eastwood* (Nos. 709, st.; 710, fr.; A., M.; "shrub 1.2 m. high"); Twenty-four miles House, in a springy place, June 25, 1914, *A. Eastwood* (Nos. 384, fr.; 385, m.; A., M.; in No. 385 folia partim satis dense serrata); Herschel Island, August, 1914, *F. Johansen* (No. 209, 93485, O.; fr.).

NORTH WEST TERRITORIES. Fort Franklin, Mackenzie River, "near Lake" *Richardson* (f., type; K.; st.; G.); Minto Inlet, 1852, coll. ? H.M.S. Enterprise (f.; K.; on the same sheet with the type); between Great Bear Lake and mouth of Coppermine River, without date and coll. (fr.; K.; on same sheet with type); Bernard Harbour, July, 1915, *F. Johansen* (No. 308a = 93779, O.; f.); Repulse Bay, south of Melville Peninsula August 22, 1821, *Parry* (f.; G.; same as No. 93 Hb. H.B. & T.; pedicello piloso).

2. *S. calcicola* Fernald & Wiegand in *Rhodora* XIII. 251 (1911). — *Salix* spec. Macoun in *Bot. Gaz.* XIII. 117 (Notes Fl. of James Bay) (1888). — *S. Richardsonii* Bebb, l. c. XIV. 50 (1889), quoad specim. Bellii, non Hooker. — *S. Richardsonii* var. *Macouniana* Bebb, l. c. 50, t. 9 (1889). — *S. lanata* var. *Macouniana* Bebb according to Macoun in *Ann. Rep. Geol. Surv. Can.* n. s. III. 70, J (1889), nomen nudum. — *S. Macouniana* Rowlee in *Herb. Cor.*, nom. ined., non *S. Macounii* Rydberg. — This interesting and well marked species has been fully described by Bebb and by Fernald who gives the best account of it. The type was collected by J. M. Macoun on the south Twin Island, according to the original label, a statement already made by Bebb, while Macoun himself in his account of the expedition

to James Bay said "on the north Twin Island" as cited by Fernald who probably did not see the type specimen.

I have been able to examine the following specimens which, so far as I know are all that exist in herbaria.

KEEWATIN (Manitoba). Hudson Bay, Churchill, August 3, 1910, *J. M. Macoun*.

ONTARIO. James Bay, South Twin Island, July 17, 1887, *J. M. Macoun* (No. 79154, O.; st.; C., Cor., G., N.) (No. 25, m.; C. sheet No. 7626, type of var. *Macouniana* Bebb).

QUEBEC. Northwestern Ungava, east coast of Hudson Bay, River Kovik, Lat. 61° 59', August 13, 1898, *A. P. Low* (No. 23038, st.; O.); along the Ungava River, August 23, 1896, *W. Spreadborough* (No. 13694, fr.; C., Cor., N., O.); Gaspé peninsula, Table-top Mt., calcareous cliffs, facing north, 900–1125 m., August 7, 1906, *Fernald & Collins* (No. 211, m., fr.; G., N.).

NORTHERN LABRADOR. Nachvak, crevices of rocks, July 1885, *Bell* (No. 34, fr.; C.; referred by Bebb to *S. Richardsonii*); Port Burwell, Hudson Strait, July 29 and 31, 1904, *L. E. Border* (No. 63044/5, fr.; O.); July 18, 1910, *J. M. Macoun* (No. 79155, fr.; C., Cor., N., O.); Kangalaksiorvik Bay, September 1–10, 1908, *O. Bryant* (No. 75, m.; G.).

WESTERN NEWFOUNDLAND. Ingornichoix Bay, dry rocky limestone barrens, near sea-level, August 1, 1910, *Fernald & Wiegand* (No. 3151, fr.; G.; "prostrate"); Point Riche, limestone barrens, near sea-level, August 4, 1910, same coll. (No. 3152, fr.; G.).

3. *S. Barrattiana* Hooker, Fl. Bor.-Am. II. 146, t. 181 (1839). — Andersson in De Candolle, Prodr. XVI.² 274 (1868), incl. var. *latifolia*. — Bebb in Bot. Gaz. XIV. 51 (1889). — Rydberg, Fl. Rocky Mts. 196 (1917). — *S. (lanata) americana* a. *Barrattiana* Andersson in Öfv. Svensk. Vet.-Akad. Förh. XV. 119 (1858); in Walpers, Ann. Bot. v. 747 (1858). — *S. lanata* var. *Americana* forma a. *S. Barrattiana* in Proc. Am. Acad. IV. 59 (Sal. Bor.-Am. 13) (1858). — *S. lanata Barrattiana* Andersson in De Candolle, Prodr. XVI.² 274 (1868), pro synonym. — *S. Albertana* Rowlee in Bull. Torr. Bot. Club, XXXIV. 157 (1907). — *J. K. Henry*, Fl. S. Brit. Col. 100 (1915). — This species has been well described and figured by Hooker from specimens collected by Drummond in alpine swamps of the Canadian Rockies where it is found in Alberta and British Columbia. The history of *S. Barrattiana* has already been fully given by Bebb. It had not been rediscovered since Drummond until 1885 when *J. Macoun* found it in the Kootenay District of British Columbia at Kicking Horse Lake. Andersson (in 1858) gave the correct type locality but in 1868 made a mistake and cited "Fort Franklin Americae subarcticae (Richardson, Douglas)" a quotation apparently taken from his note in 1858 to *S. Richardsonii*. As Bebb has already explained Douglas never collected at Fort Franklin.

In 1868, Andersson proposed two forms: *latifolia* and *angustifolia* without mentioning a type. His var. *latifolia* is nothing but typical *S. Barrattiana*. His var. *angustifolia* is scarcely worth keeping as a distinct form, although it has been made a species by Rowlee who described it as *S. Albertana* saying that "it is quite probable that our species is *S. Barrattiana* var. *angustifolia* And." He, however, states that his new species "differs fundamentally in form and vesture of the leaf" from *S. Barrattiana*, but he also said: "*S.*

Albertana has thick opaque leaves acute at the base and apex and agrees with *S. Barrattiana* in vesture." The shape of the leaves is very variable, and we may distinguish a forma *angustifolia* but I do not think that is it of great taxonomic value. The length of the style too varies from 1.2 to 2.5 mm., and in very young flowers it is often difficult to measure its exact length.

I have seen the following specimens of typical *S. Barrattiana*:

ALBERTA. Rocky Mts., locality uncertain, alpine swamps, *Drummond* (m., f.; K.; same as No. 77 Hb. N. B. & T.; No. 650, N.; copy and fragment in C.); Edson District, Athabaska River, near Lac Brulé, alpine slopes, 1650 m., June 30, 1898, *W. Spreadborough* (No. 20348, O.; fr.); Brulé, near tree limit, June 24, 1918, *W. Spreadborough* (No. 95809., O; m.; A.); Jasper Park, Great Goat Mt., around a spring in woods, about 2000 m., July 24, 1918, *J. M. Macoun* (No. 95780, f.; o., A.); Fitzhugh Mt. about 2000 m., August, 1917, *J. M. Macoun* (No. 95402, st.; O.: "1.2 m. high"); Mt. Edith Cavell, about 2300 m., August 27, 1917, same coll. (No. 95306, st.; O.); Shovel Pass, about 2250 m., August 9, 1918, same coll. (95742, 95744, fr.; A., O.); same place, swampy place near tree limit, August 1, 1918, same coll. (No. 95730, fr.; 95731 m.; A., O.); Rocky Mountain District, Rocky Mt. Park, Lake Agnes near Laggan, about 2200 m., August 11, 1897, *C. S. Sargent* (st., A.; "low shrub"); Lake Louise, July 27, 1895, *W. M. Canby* (No. 5, f.; C.); same lake, August 10, 1904, *A. Rehder* (fr.; A.); same place and date, *J. G. Jack* (st.; A.); same place, August 15, 1909, *Olson* (fr.; G.); Laggan, June 28, 1904, *J. Macoun* (No. 68885, st.; N., O.); vicinity of Banff, summit of Mt. Edith Pass, about 2250 m., June 30, 1899, *Dawson* (No. 22337, f.; O.); high mountain slopes in rather wet ground, 2150-3600 m., June 30, July 18, August 4, 1899, *W. C. McCalla* (No. 2251, m., f., fr.; Cor.; type of *S. Albertana* Rowlee); Summit of Pipe Stone Creek, July 5, 1904, *J. Macoun* (No. 68884 m., f.; N., O.); Sulphur Mt., damp spots, July 22, 1891, *J. Macoun* (No. 24 in C., No. 24280, O., fr. im.; Cor.); Mt. Aylmer, 2600 m., August 6, 1891, same coll. (No. 24281, fr.; C., O.).

BRITISH COLUMBIA. Kootenay District, Kicking Horse Lake, swamps, July 28, 1885, *J. Macoun* (No. 26, 24284, fr.; C., O.); mountains at Kicking Horse Lake, by alpine rivulets, August 12, 1890, same coll. (No. 242282 fr., O.; No. 22 in C.); without exact locality, summit of Rocky Mts., August, 1889, *J. Macoun*, (No. 22, fr.; A., G.; in M. from August, 1890, large leaves very similar to those of var. *Tweedyi*, but rather pubescent); Selkirk Mts., at Glacier, August 13, 1897, *W. M. Canby* (No. 262, st.; G.); Asulkan Pass, August 23, 1904, *J. Macoun* (No. 68886, f.; O.); Dumnut (?) Lake, 1900 m., June 30, 1904, *H. Petersen* (No. 64, m.; G. M. N.); Yoho (?) Valley, Flat, 2000 m., July 2, 1903, *M. A. Barber* (No. 298 partim. m., G.; mixed with m. specimen of a species of sect. *Cordatae*).

S. Barrattiana seems not to occur in the United States, but there is the following variety which represents the type in Montana and Wyoming. Ball regarded it as a good species and in Herb. W. he also referred to it a specimen from British Columbia, Emerald Lake, Avalanche Path, collected on June 20, 1904, by R. T. Shaw (No. 1, m., f.; named *S. conjuncta* by Macoun). If this specimen really belongs to this variety it would connect its range with that of the type. The synonymy of the variety is as follows:

3b. *S. Barrattiana* var. *Tweedyi* Bebb apud Rose in Contrib. U.S. Nat. Herb. III, 572 (Pl. Bighorn Mts. Wyo.) (1896).¹ — *S. Barclayi* Rydberg in

¹ Bebb gave the description in May 1894 in a letter. But "the varietal name [*denudata*] used by Mr. Bebb being preoccupied has been changed to the one given above." Rose in note.

Mem. N.Y. Bot. Gard. I. 111 (Cat. Fl. Mont.) (1900), quoad specim. Coulteri, non Andersson. — *S. Tweedyi* Ball in Bot. Gaz. XL. 377, pl. 12, figs. 3–7 (1905); apud Coulter & Nelson, New Man. Rocky Mts. Bot. 135 (1909).

I am not fully convinced of the accuracy of Ball's statement "that this Willow is specifically distinct from *S. Barrattiana*." In 1905, he said: "Not only do the nearly glabrous leaves and the glabrous capsules serve to distinguish it, but the leaf margin thickly set with conspicuous glands is a marked character." In his diagnosis he, however, states: "capsules green and glabrous, or sometimes finely pubescent near the apex." The glands or glandular dentations of the leaf margin very often occur in *S. Barrattiana* where they are usually hidden by the pubescence of the leaf. The shape of the leaves varies in the same manner in both forms. In the characters of the flowers I cannot detect any difference; the bracts, too, are obovate-lanceolate, not obovate. In var. *Tweedyi* the leaves usually possess some stomata in the epidermis of the upper surface while these are wanting in the type. This character needs further observation. In 1909 Ball gives the range as follows: "In bogs and along mountain streams, 2500–3000 m. altitude, not common; known only from the Bighorn Mountains of northern Wyoming, the Yellowstone Park, and Teton Basin." From what I have seen I can record the following specimens of var. *Tweedyi*.

WYOMING. Sheridan County: head of Big Goose Creek, Bighorn Mountains, July 15–24, 1893, *F. Tweedy* (No. 11, fr. im., type; G.; in C. No. 11 f., 12 m., fr. im.; same in W.); Tongue River, about 3070 m., July 13, 1900, *J. G. Jack* (fr.; A.); Bighorn Mountains, about 3200 m., August, 1899, *F. Tweedy* (No. 2447, fr.; N.; amentis 7.5:1.8 cm. magnis); head waters of Tongue River, July, 1889, *F. Tweedy* (No. 87, fr. im. 86, fr.; N.). Lincoln County: Two-Two (?) Tea Pass, about 3300 m., August, 1897, *F. Tweedy* (No. 300, st.; N.). ? County: Chug Creek, June 10, 1898, *E. Nelson* (No. 4349, f. tantum [m. = *Bebbiana*]; C., N.; Ball refers the female to *S. monticola* in W.).

MONTANA. Park County: Trail River Mountains, 1872, *J. M. Coulter* (f.; N., W.); Madison, Spanish peaks, July 20, 1901, *J. Vogel* (m., f.; Cor.); Yellowstone Park, Electric Peak, July 26, 1902, *E. C. Shear* (No. 109, f., ex parte; N., W.; part of the number belongs to *S. Barclayi*).

4. *S. amplifolia* Coville in Proc. Am. Acad. Sci. II. 282, t. xv (1900); III. 314, t. 35 (1901). — I cannot add anything to Coville's excellent description and plate after having seen the type which was collected at Indian Village on June 22, 1899, by Coville and Kearney (No. 1153, f.; W.). So far the species is only known from Yakutat Bay, Alaska, where it "was first observed on the west shore of the bay growing on and near the sand dunes that lie back of the beach, and has afterward been collected in Disenchantment Bay, Egg Island, Hubbard Glacier, and Haenke Island, and later at the Indian village at the head of Yakutat Bay east shore." As Coville says: it "bears considerable resemblance to *richardsonii* and *barclayi*, but the species from which it differs least is *Salix hookeriana*." Both lack the stipules so conspicuous in *S. Richardsonii* and the main difference between *amplifolia* and *Hookeriana* is indicated in the key on p. 213. *S. Hookeriana*, too, has a

short peduncle often provided with very small leaves. The development of a more or less leafy peduncle is a character of no great stability in certain species, and it apparently varies a good deal in *S. Hookeriana*. At present it is difficult to make a definite statement as to the true relationship of *S. amplifolia* which has the long styles of the *Richardsonii* group while in *S. Hookeriana*, *S. Piperi*, and *S. laurentiana* the styles scarcely measure up to 1.3 mm. in length.

Of *S. amplifolia* I have only seen the specimens already cited by Coville.

5. *S. Hookeriana* Barratt apud Hooker, Fl. Bor.-Am. II. 145, t. 18 (1839). — Nuttall, N. Am. Sylva, I. 64 (1843). — Andersson in Öfv. Svensk. Vet.-Akad. Förh. xv. 119 (1858); in Proc. Am. Acad. IV. 59 (Sal. Bor.-Am. 13) (1858); in Walpers, Ann. Bot. v. 747 (1858). — Bebb in Bot. Gaz. XIV. 25 (1889); xv. 53 (1890). — Sargent, Silva, IX. 147, t. 485 (1896). — Howell, Fl. N. W. Am. I. 619 (1902). — Schneider, Ill. Handb. Laubh. I. 48, fig. 26g, 27n-o (1904). — Ball apud Piper & Beattie, Fl. Northw. Coast, 116 (1915). — Henry, Fl. S. Brit. Col. 99 (1915). — The history of this species and the origin of the type has been explained by Bebb. I have seen a photograph of the type and fragments from Herb. Kew. According to my observations the type has glabrous ovaries, and the gray pubescence of the leaves is mixed with a few fulvous hairs. Such a mixture often points to a hybrid with *S. Scouleriana* Barratt, but judging by the flowers there is no indication of such an influence in the type of *S. Hookeriana*. As a rule the number of the fulvous hairs in the pubescence of *S. Hookeriana* is very small, and it is usually difficult to detect them.

The type was collected by Scouler somewhere at the "N. W. Coast of America" (probably on Vancouver Island), but Hooker quoted in the first place "near Grand rapids of the Saskatchewan, rare. Douglas." This is a mistake as shown by Bebb; Andersson repeated the mistake and made it worse by only quoting the obscure Douglas specimen and omitting Scouler's plant. I have seen a photograph of Scouler's plant, and it agrees well with the plate as Bebb explained in 1890.

The range of *S. Hookeriana* is restricted to the sea coast from Vancouver Island to Coos County in Oregon. It is according to Howell "plant of the sea coast and salt marshes, usually growing on the margin of ponds, but confined in its range to the immediate proximity of the sea." Professor J. K. Henry at Vancouver, to whom I am indebted for good material of the species, has proposed (Fl. S. Brit. Col. 99 [1915]) a var. *laurifolia* which he describes as follows: "Stem ascending, twigs stout, as in species; less tomentose to nearly or quite glabrous, leaves finally shining above, strongly glaucous and more or less pubescent (not tomentose) beneath; petioles 1-1.25 cm. long; capsule glabrous or slightly pubescent at apex. The yellow leaves are very striking in the autumn, while in the species the leaves usually blacken. Near *S. Piperi* from which it differs mainly in the pubescence. Forms of *S. Hookeriana* with leaves approaching those of this var. and with tomentose twigs are not rare; and there can be no doubt that

the capsule of *S. Hookeriana* is often nearly or quite glabrous." According to a letter from the author of March 9, 1919, var. *laurifolia* prefers a drier position than the species. This is very abundant at Vancouver and especially about New Westminster where it is usually found in very wet places. "Probably this is the explanation of the difference in the autumn colours." *S. Hookeriana* "grows in clumps usually 1.5–3 m. high, or occasionally 5 m. high. Only rarely have I seen a single stem attaining the size Howell mentions" [rarely even 30 feet in height]. So far as I can judge by the material which I have seen, var. *laurifolia* is a variety well worth its name. Not unfrequently it seems to be somewhat intermediate between typical *Hookeriana* and *S. Piperi* (see for example Lamb's No. 1104) which, as I shall presently explain, needs further observation, and may represent nothing but an extreme form of the species.

As Bebb has already stated, there is a rather common form with more or less hairy ovaries which are entirely glabrous in the type. J. K. Henry has sent to me specimens with totally tomentose ovaries and fruits named var. *tomentosa* (which however neither in the pubescence nor in the flowers show any influence of *S. Scouleriana*). I think we may accept this name for such a form, and — it being not published — I propose

5c. *S. Hookeriana* var. *tomentosa* J. K. Henry, in Herb., var. nov. — A typo nonnisi differt ovariiis et saepissime etiam fructibus omnino vel pro parte maxima tomentosus.

I have seen the following specimens of *S. Hookeriana* which partly (as indicated) belong to one of the two varieties mentioned.

BRITISH COLUMBIA. Vancouver Island, locality uncertain, *Scouler* (m., f.; K.; ovariiis glaberrimis, filamentis ima basi pilosis et coalitis; type; same as No. 9 Barratt in N.); district of Renfrew, edge of the forest along the beach, August 12, 1902, *C. O. Rosendahl* (No. 922, f.; A.; ovariiis tantum apice pilosis); near Victoria, June, 1896, *J. R. Anderson* (fr.; A.; fructibus maturis glabris); Beaver Lake, May, 1897, same coll. (m., f.; W.); Blanc Lake, May 2, 1897, same coll. (m.; A.); Vicinity of Uclulet, May 24, 1899, *J. Macoun* (fr.; 17240, O. C.); Vicinity of Victoria, May 18, 1893, *J. Macoun* (No. 481, f.; A., C.; ovariiis glabris); same locality, May 26, 1893, same coll. (No. 480, fol. juv. tantum; C., M.); May 25, 1908, same coll. (No. 76784, m.; C., N.); April 25, 1908, same coll. (No. 76785, f.; C., N.); May 13, 1908, same coll. (No. 76781, fr. submat. dense villosis vel tomentose; N.); Cowichan Park, May 22, 1911, *Spreadborough* (No. 83861, st. Cor.); vicinity of Comox, June 26, 1893, *J. Macoun* (No. 479, st.; C.) without exact locality, June 16, low wet places, *J. Macoun* (No. 1, in C. [sheet 7543]; m., f., fr., st.); New Westminster County, by the sea, April 11, 1889, *J. Macoun* (No. 3a, C. [sheet 7544]; m., f., st.); New Westminster Road, April 20, 1889, *J. M. Macoun* (m., f.; G.; ovariiis parte inferiore glabrescentibus); Lower Fraser River, 49, N. Lat., 1859, *Lyall* (m., G.; filamentis partim ut videtur glabris); near New Westminster, low ground, May 10, 1914, *J. K. Henry* (No. 1424, fr., 1426, m.; A.; ovariiis apice et pedicellis pilosis); May 10, September 27, 1914, same coll. (No. 21, fr., st., A.); Lulu Island, low ground, April 10, September 21, 1914, same coll. (m., f.; st.; A.); May 4, 1915, same coll. (f.; A.); same Island, May 20, 1914, *A. J. Hill* (m., f., Brookl.); Mayne Island, May 20, 1914, *J. M. Macoun* (No. 90154, st.; O.); Douglas, May 6, 1906, *W. Spreadborough* (No. 79561, f.; Cor.).

WASHINGTON. King County: Seattle, June 8, 1890, *C. V. Piper* (fr.; G., M.;

fructibus glabris; foliis partim subtus pilis sparsis fulvis preaditis). Chehalis County (Gray's Harbor): Cohasset Beach, May 25, 1897, *F. H. Lamb* (No. 1126, fr. im.; M.; var. *tomentosa*); Hoquiam, May 10, 1897, same coll. (No. 1004, fr.; M., N.; var. *laurifolia*; by Piper referred to *S. Piperi*); Gray's Harbor City, May 13, 1897, same coll. (No. 1035, m., N. M.); same locality, without date and coll. (Capt. Wilkes Exp. No. 217, st.; W.); Westport, May 26, 1897, *F. H. Lamb* (No. 1124, m., N.); same loc., dunes, July 10, 1907, *H. C. Cowles* (No. 506, st.; C.). Pacific County: Long Beach, Ocean Beach, September 6, 1891, *L. F. Henderson* (st.; A., C., Pu., W.; ex parte tantum).

OREGON. Clatsop County: Astoria, mouth of Columbia River, July 13, 1880, *G. Engelmann* (st.; M.); same place and date, *Engelmann & Sargent* (No. 14, f.; A., C.); mouth of Columbia, May, 1887, *Th. Howell* (f., fr.; C.); same place, August 31, 1898, *F. C. Coville* (No. 842, st.; W.); Morrison, March 28, April 10, May 1, 1900, *F. A. Walpole* (Nos. 1006, m., f.; 1017 m.; 1033, fr.; W.). Douglas County: mouth of Umpqua River, on marine beach, August 11, 1880, *Engelmann & Sargent* (No. 18, f.; A., C.; "tree 20 ft. high, 12 in. diam."; ovarii apice et pedicellis pilosis; in A. mixed with *S. Scouleriana*). Curry County: near Agness, swamp, June 13, 1913, *J. C. Nelson* (No. 1452, fr.; G.); Chetco, March near Chetco River, May 4, 1902, *F. A. Walpole* (No. 2142, f.; W.); same place, on bank along beach, May 8, 1902, same coll. (No. 5152, f.; W.). Lincoln County: Yaquina Bay, April and May, 1886, *Th. Howell* (m., f.; N., W.); in C. without date, near Cape Foulweather (20 ft. high, 6 feet diam.). Coos County: Ross Slough, May 10, 1911, *H. H. Smith* (No. 3669, fr.; C.); South Fork Coos River, March 30, 1911, same coll. (No. 3599, f.; C.); Coos River, April 5, 1911, same coll. (Nos. 3607, f., 3608, m.; near var. *laurifolia*); same place, March 22, 1911, same coll. (No. 3570, f.; C.; same as preceding); Coos Bay, swamps ins and dunes near seashore, August 19, 1911, *H. D. House* (No. 4726, st.; W.); Empire, on exposed coast, October 12, 1909, *V. Bailey* (st.; W.). ? County hillsides near coast, July-August, 1901, *J. E. Kirkwood* (No. 165, st.; N.).

6. *S. Piperi* Bebb in Gard. and Forest VIII, 482 (1895). — Ball apud Piper & Beattie, Fl. Northw. Coast, 116 (1915). — *S. lasiolepis* var. *Bigelovii* Auct., non Bebb, ex parte. — This willow has been best described in a field note sent to Bebb by Piper who collected it first. He said: "During several seasons that I was especially interested in the collection of Willows, I found, near Seattle, only three plants, with one or two at other points. Two of these, staminate, grew, one in a swamp near Lake Union, the other not far distant in a Sphagnum bog on high ground. Both had several stems rising from the same root eighteen to twenty feet high, not much branched till near the top; branchlets dark colored and smooth. The one pistillate plant grew at the edge of Lake Washington, three miles from the staminate mentioned above, in the old gravel beach of the lake. This, also, had several stems three to four inches in diameter, with a smooth dark grayish bark, sparingly branched; branches erect. Owing to its extreme isolation the aments were imperfectly fertilized — perhaps by the pollen of *Salix Scouleriana*, which grew in the vicinity and flowered at the same time." Bebb stated that *S. Piperi* is most nearly related to *S. Hookeriana* but differs "in the entire absence of that grayish pubescence on both leaves and twigs so characteristic of *S. Hookeriana*. The leaves in one form are similar in outline, in others much narrower, with a very irregular repand margin. The beautiful silky aments are like those of *S. Hookeriana*. The filaments,

occasionally united at base, is a marked characteristic of *S. lasiolepis*, and it is not improbable that *S. Piperi* will be found to vary in the direction of that species. It seems . . . to combine the characters, of . . . *S. Hookeriana* and *lasiolepis*, while abundantly distinguished from both."

I have seen Bebb's type in Herb. C., and I find that the capsules are not "smooth" as said in the original description and repeated by Ball, but slightly hairy at apex. This is also true of specimens collected by Piper and preserved in Herb. G., marked by the collector "duplicate type material." The filaments in both specimens are somewhat united and hairy at the base.

This species much resembles *S. Hookeriana* var. *laurifolia* as already stated. It also reminds me of what is called *S. lasiolepis* var. *Bigelovii* of Washington and Oregon. Unfortunately I am not well enough acquainted with the *Cordatae*-group to which the last variety belongs. Therefore, I do not wish to express to-day a definite opinion on the taxonomic value and the true affinity of *S. Piperi*. Some of the specimens I am going to quote seem to represent a good species, while as a whole the material which I have seen is by no means sufficient to decide whether it consists of forms of different (partly hybrid) origin or can be regarded as belonging to one variable species. The fact that some specimens point to the *Cordatae* and some to *S. Hookeriana* may be explained by the hybridization of *S. Piperi* with the last species and with forms of the *Cordatae*. After all it needs a careful study in the field. I have not yet seen well matured fruits which are said by Ball to measure 6 to 7 mm. in length. The following specimens have been seen.

WASHINGTON. King County: Union Lake and Lake Washington near Seattle, 1888, *C. V. Piper* (No. 458 and 560, type in Herb. Bebb in C., sheet 2462, f., 2464 m.) probably same place, April-September, 1889, *Piper & Smith* (m., f., st.; G. marked by Piper "duplicate type material"; mixed with typical female *S. Hookeriana*); March 29, 1889, *E. C. Smith* (m.; M.; filamentis satis pilosis); April 4, 1889, same coll. (m., f.; M.; ramulis annotinis biennibusque sparse puberulis; resembles much *S. Hookeriana* var. *laurifolia*); July 11, 1889, same coll. (st.; M.); April 20, 1892, *C. V. Piper* (m.; A.); damp and marshy places, April 22, 1911, *E. M. Bardell* (m., f.; M.; amentis praecocibus); swamp near Olympia, August 23, 1892, *L. F. Henderson* (m., st.; C.); Tacoma, stagnant pools and springs, April 24, May 9, June 7, 1901, *J. B. Flett* (No. 1875, m., f., fr., st.; W.). Cowlitz County: Lake Merrill, July 18, 1898, *F. C. Coville* (No. 751, st.; W.).

OREGON. Clackamas County: Oregon City, April, 1885, *Th. Howell* (m., f.; W.; sub nomine *lasiolepis Bigelovii*, but determined by Ball *S. Piperi*); Ball (1915) states that in Oregon it ranges "southward through the Willamette Valley to Curry County."

7. *S. laurentiana* Fernald in *Rhodora* ix. 220 (1907). — I have seen the type material and besides that only one specimen from southern Labrador. The male plant is not yet known, and this species needs further investigation. There are a few statements in Fernald's original description which according to my observation are not quite correct. He says that the fruiting aments measure up to 9 cm. in length while I have not seen any longer than 7 cm., and the style is not very short (*brevissimo*) but up to 1 mm.

long. The capsules are from 5 to 7 mm., and the pedicels about 1 mm. long, and from one half to twice (not 3 times) longer than the gland.

The type was collected by Fernald & Collins in Quebec, Gaspé County, at Mechins, on July 12, 1906 (No. 202, fr.; G.), and the species also occurs in Matane County and, as I have already said, in southern Labrador where it has been found by A. C. Waghorne, at Blanc Sablon, July 27, 1893 (No. 1, ex parte, fr.; W.; mixed with *S. planifolia* Pursh). Fernald says in his remarks that *S. laurentiana* suggests in its foliage and tomentose branchlets *S. amplifolia* which, however, can be distinguished at once by its glabrous ovaries, the long style and the absence of stipules; he compares it also with *S. glaucophylloides* which belongs to section *Adenophyllae*. In my opinion it comes nearest to *S. Hookeriana*, but the male plant as I have stated is still unknown; and I have not seen enough material to get a good idea of the real relationship of this interesting species.

8. *S. alaxensis* Coville in Proc. Wash. Acad. Sci. II. 280 (1900); l. c. III. 311, t. 34 (1901). — Sargent, Silva N. Am. XIV. 65, t. 729 (1902); Man. Trees N. Am. 188, p. 160 (1905). — Ostenfeld in Vidensk.-Selsk. Skrift. I. Math.-Nat. Kl. 1909, No. 8, 36 (Vasc. Pl. Arct. N. Am. Gjöa Exp.) (1910). — *S. arenaria macrostachys* Richardson in Franklin, Narr. Journ. Polar Sea Bot. App. 753, No. 400 (1823); ed. 2, Bot. App. 37 (1823), non Schleicher. — *S. speciosa* Hooker & Arnott, Bot. Beechey Voy. 130 (1832), non Host in 1828. — Hooker, Fl. Bor.-Am. II. 145 (1839). — Seemann, Bot. Voy. Herald, 40, t. 10 (Fl. West, Eskimaux-Land) (1852-57). — Andersson in Öfv. Svensk. Vet.-Akad. Förh. xv. 119 (1858); in De Candolle, Prodr. XVI.² 275 (1868), excl. var. *a* etc. — Gray in Proc. U.S. Nat. Mus. VII. 528 (Notes Pl. Stejneger) (1885). — *S. speciosa* var. *Alaxensis* Andersson in De Candolle, l. c. 275 (1868). — ? *S. Barrattiana vestita* Kurtz in Bot. Jahrb. XIX. 406 (1894). — “Although there is no fructification on the specimen of this plant, yet it is altogether so remarkable in appearance, and so unlike any other *Salix* with which we are acquainted, or can find described, that we venture on giving it a name and character.” This is a very correct statement of the author, and the species indeed is one of the best marked among Willows. I do not wish to repeat what has been said by Coville who gave a good description of the main characters of this Willow and of its distribution. He cites a good many specimens to which I add the following:

ALASKA. May 7, 1916, *E. P. Walker* (No. 1037a, m.; G.); White Pass, July 23, 1914, *A. Eastwood* (No. 881, st.; A.); Copper River region, along river bank, June 23, 1902, common, *W. L. Poto* (No. 57, fr.; W.; “18 ft. high”); August 17, 1902, same coll. (No. 154, st.; W.; “15-25 ft.”). Kodiak Island, Karluk, near river below hatchery, May 25, 1901, *W. T. Horne* (m.; N.; “solitary tree scrubby about 8 feet & seven inch. at the base”); lower course of Karluk River, mostly on little islands in river channel, May 12, 1903, *C. Rutter* (Nos. 66, f., 67 m.; W.; “10 ft. high, coarse branches”); along Sturgeon River near Karluk, May 5 and 8, 1897, same coll. (m., f.; St.; buds collected November 5, 1896; St.); N. E. Harbor Creek, August 3, 1902, same coll. (st.; N.); along river above same creek, June 9, 1901, same coll. (m.; N.); Ditchcreek above dam, May 27, 1901, same coll. (f.; N.; “trees reaching

15 ft. and 5 or 6 in.”). Kotzebue Sound, without exact locality, “July-September, 1826,” *Beechey* [Lay & Collie] (st.; type in K.). Kuskokwim Valley, 1884, *Weinmann* (st.; G.). Vicinity of Port Clarence, tundra at Teller Reindeer Station, July 26, 1901, *F. A. Walpole* (No. 1548, fr.; W.; foliis etiam superne dense sericeo-villosis); on gravelly flats at Mission Creek, July 13, 1901, same coll. (No. 1433, fr.; W.). Arctic regions, without exact locality, Capt. *Parry* (ex Herb. Torrey in G.; a very small steril fragment with two female fragments of *S. arctica* Pall.).

YUKON TERRITORY. King Point, *A. H. Lindström*, July 4, 1906 (st.; N.). Carcross, July 16, 1914, *A. Eastwood* (No. 687, st.; A.); Lake Lindeman, head of Yukon River, June 12, 1883, *F. Schwatka* (No. 15, fr. juv.; G.); Ingersoll Islands, moist sloughs and river bottoms, May 28, 1899, *M. W. Gorman* (No. 985, f.; N., O.; W.); Lake Bennett, lake shore and upland, June 6, 1899, *I. B. Tarleton* (No. 12, ex parte f.; N.; “up to 12 feet high, 4 in. diam.”).

NORTHWESTERN TERRITORIES. Mackenzie River, north of Arctic Circle, 1898, *J. McConnell* (f.; C.); Fort Franklin, Mackenzie River, *Richardson* (No. 653, f.; G.; same as No. 81, Hb. H.B. & T.; K.); Great Slave Lake, Caribou Island, July 2, 1907, *Seton & Preble* (No. 65, fr.; O.); Upper Liard River, Lat. 60-62, June 27, 1887, *Dawson* (No. 28b., fr.; C.).

BRITISH COLUMBIA. Bennett, July 17, 1914, *A. Eastwood* (No. 726, st.; A.).

Richardson who first referred to this plant applied a name of Schleicher to it, saying: “400. *S. arenaria*, macrostachys: Schleicher, *S. limosa*: Wahl. Lapp. p. 265? (B.)” In Herb. N. (Herb. Barratt) there are male and female fragments of *S. alaxensis* with the label: “This specimen is identical with 413 Richd. app. 37, the *Salix arenaria macrostachys!* — *S. speciosa* Hooker.”

Coville states that the stout twigs are either smooth or densely hairy, and sometimes they have a decidedly blue color from the presence of a conspicuous bloom. This last form has been collected by Miss A. Eastwood in many numbers, especially at Dawson. In a field note this well known collector says: “At Dawson no specimens have tomentose twigs and all have young twigs covered with a bluish bloom. Some plants have red stems, others yellow. Those with red stems have red pistils if female and red anthers when young if male. The two may be side by side so it does not seem due to soil.” “This is the only species in the Yukon that becomes a tree but it is frequently shrubby. One grove of slender trees is near the brewery at Klondike City, across the Yukon, some about fifty feet high but none more than six inches in diameter. The tree has a smooth greenish bark on the trunk. I saw no trees over a foot in diameter. It is first in bloom and the flowering trees swarm with various lepidoptera, diptera and hymenoptera. I had no facilities for either collecting or preserving, so can't find out the species. The woolly stemmed ones were found only at greater elevation than Dawson. It is most beautiful in flower. The leaves seem to be much eaten by insects and the female catkins on some bushes were full of small smooth caterpillars which hatched out while specimens were drying.”

This glabrescent form with pruinose twigs is rather conspicuous and worthy of being made a distinct variety. There is already a name for it, because Rydberg has described a *S. longistylis* which unfortunately he did not compare with *S. alaxensis* and which according to Coville “is clearly

identical with *alaxensis*." The type of *longistylis* was collected by Williams at the "mouth of Klondike," and after having seen it I am convinced that *S. longistylis* represents this pruinose form. Therefore I propose the following variety:

8b. *S. alaxensis* var. *longistylis*, var. nov. — *S. longistylis* Rydberg in Bull. N. York Bot. Gard. II. 163 (1901), non *S. longistyla* Gandoger, Fl. Eur. XXI. 96 (1890). — A typo nonnisis differre videtur ramulis novellis laxius vel sparse villosis annotinis glabris flavo-brunneis et (ut etiam biennes) saepissime satis pruinosis. — To this variety which clearly is connected with the type by many intermediate forms the following specimens should be referred which partly had been referred to typical *S. alaxensis* by Coville.

ALASKA. Glacier to White Pass R.R. Skagway, June 9, 1900, *F. A. Walpole* (Nos. 1071, f., 1077, f., fr.; W.); Muir Glacier, June 9, 1899, *Trelease & Saunders* (No. 3344, fr. im., 3347 f.; A., M.); June 11, 1899, same coll. (No. 3345, f.; M.); June 12, 1899, same coll. (No. 3348, fr. im.; M.). Yakutat Bay, Hidden Glacier Inlet, June 20, 1899, same coll. (No. 3349, f.; M.); Prince William Sound, Fort Wells, June 26, 1899, same coll. (No. 3372, fr. im.; M.); Kodiak Island, near Kodiak Village, July 2, 1899, same coll. (No. 3351, st.; M.); Kodiak, July 25, 1904, *O. A. Piper* (st.; W.); Alaska Peninsula, Kukak Bay, July 5, 1899, *Trelease & Saunders* (No. 3350, st.; A., M.); Lake Iliamna region, on open slopes along Iliamna Bay, June 22, 1902, *M. W. Gorman* (No. 142, fr.; W.); Anvik, Yukon River, April, without year, *J. W. Chapman* (No. 41a or d, f.; G.). Bergman region, Koyukuk River, Arctic Circle, 1901, *F. C. Shrader* (f.; W.). Valley of Kobuk River, 3 miles below Walker Lake, August 10, 1901, *W. C. Mendenhall* (st.; W.; "quite common, 6-12 feet high"); about 45 miles below Walker Lake, August 17, 1901, same coll. (st., W.; tall slender Willow, very common along river, from 12 to 25 feet high). Rampart, June 16, 1901, *I. Jones* (No. 19, fr.; W.); July 20, 1901, same coll. (No. 1; W.; 20-25 ft., "very few branches and those near the top of the tree"), same place, July 10, 1903, *A. Hollick* (fr.; N.). Dall River, 65 miles above mouth, 1901, *C. W. Mendenhall* (fr.; W.); Coldfoot, July 16, 1904, *O. A. Piper* (st.; W.); Fort Yukon, July, 1900, *C. C. George-son* (No. 18, f.; W.); Port Wells, June 26, 1899, *W. H. Brewer & Coe* (No. 136, fr. jub.; W.).

YUKON TERRITORY. Ingersoll Islands, moist sloughs and river bottoms, May 28, 1899, *M. W. Gorman* (W. 986, m.; N.). Islands in Klondike River at Dawson, July 15, 1902, *J. Macoun* (No. 54395, O., st.; G.); Dawson, April 26, 1914, *A. Eastwood* (No. 12, m. juv.; A.); May 9, 1914, same coll. (No. 111, m., fr. juv.; A.); May, 1914, same coll. (No. 75, f.; A.; 75a, st.; 76, f.; A.); June 11, 1914, same coll. (No. 179, fr. submat.; A.); June 30, 1914, same coll. (No. 464, st.; A.; foliis satis anguste lanceolatis acuminatis); banks of Klondike River, May 6, 1914, same coll. (Nos. 22, 24, m.; A., M.; Nos. 23, 25, 26, f.; A.); May 9, 1914, same coll. (No. 39, m.; A.); May 18, 1914, same coll. (No. 74, f.; A.); June 11, 1914, same coll. (No. 185, st.; A.); June 13, 1914, same coll. (No. 215, m.; A.); June 17, 1914, same coll. (Nos. 288, 288a, st.; A., M.); June 23, 1914, same coll. (No. 340, st.; A.); Cemetery Hill, May 6, 1914, same coll. (No. 143, fr. im.; A.); Bonanza Creek, May 9, 1914, same coll. (No. 38, f.; A., M.); Ogilvie, July 8, 1914, same coll. (No. 542, st. A.; foliis lanceolatis ad 10:2.5 cm. magnis); Coffee Creek, July 9, 1914, same coll. (No. 551, st. A.); Hard Luck Slough, June 10, 1914, same coll. (No. 559, st.; A., M.; foliis latis ad 12:6 cm. magnis); White Horse, July 12, 1914, same coll. (No. 618, st.; A.); Llewellyn Glacier, July 15, 1914, same coll. (No. 666, st. A.).

In the synonymy of the species I have mentioned with a query var.

vestita Kurtz of which I have not seen the type. The author of l. c. says nothing but the following: "330. *S. Barrattiana* Hook. var. *vestita* Kurtz; ramis junioribus dense albo-tomentosis, bracteis gemmarum valde pruinosis, Amenta omnia androgyna." The type was collected by A. & A. Krause, on May 26, 1881, in southeastern Alaska, "oberes Dejäththal" under No. 24.

b. SECT. CANDIDAE SCHNEIDER

This section probably consists of a single species the true affinity of which is by no means clear as I have already said on p. 211. The second Willow added by me only provisionally is too little known to understand its real relationship.

Sect. *Candidae* Schneider, Ill. Handb. Laubh. i. 46 (1904). — Sect. *Cinereae* Barratt apud Hooker, Fl. Bor.-Am. ii. 144 (1839), ex parte, — Sect. *Arcticae* v. *Subarcticae* Andersson in Öfv. Svensk. Vet.-Akad. Förh. xv. 119 (1858), ex parte. — Ball apud Coulter & Nelson, New Man. Rocky Mts. Bot. 135 (1909), ex parte. — Sect. *Niveae* s. *Glaucæ* Andersson in De Candolle, Prodr. xvi.² 275 (1868), ex parte. — Sect. *Incanae* Koehne, Deutsche Dendr. 94 (1893), ex parte, non Andersson. — Sect. *Argentea* Rydberg, Fl. Rocky Mts. 189 (1917), ex parte.

1. *S. candida* Flügge apud Willdenow, Sp. Pl. iv. 708 (1805). — Pursh, Fl. Am. Sept. ii. 608 (1814). — Poiret in Lamarck, Encycl. Suppl. iv. 66 (1817). — Hooker, Fl. Bor.-Am. ii. 144 (1838). — Barratt, Salic. Am. no. 1, adnot. (1840); apud Torrey, Fl. N.Y. ii. 204 (1843), et t. 117 sub nomine *incana*. — Forbes, Salict. Wob. 181, t. 91 (1829). — Andersson in Öfv. Svensk. Vet.-Akad. Förh. xv. 120 (1858); in Trans. Am. Acad. iv. 60 (Sal. Bor.-Am. 14) (1858); in Walpers, Bot. Ann. v. 748 (1858). — Carey apud Gray, Man. 425 (1848); ed. 2, 413 (1858); ed. 3, 413 (1862); ed. 4, 413 (1863). — Andersson in De Candolle, Prodr. xvi.² 277 (1868). — Bebb apud Patterson, Cat. Phen. Pl. Ill. 39 (1876); apud Coulter & Watson Gray, Man. ed. 6, 484 (1890). — MacMillan in Rep. Surv. Minn. Bot. ser. i, 182 (Metasp. Minn. Vall.) (1892). — Kellerman & Werner, in Rep. Geol. Surv. Ohio, vii. pt. 2, 190 (1893). — Koehne, Deutsche Dendr. 94 (1893). — Coulter in Ann. Rep. Dep. Geol. Ind. xxiv. 704 (Cat. Pl. Ind.) (1899). — Britton & Brown, Ill. Fl. i. 501, fig. 1193 (1896); ed. 2, 598 fig. 1167 (1913). — Britton, Man. 318 (1901). — Schneider, Ill. Handb. Laubh. i. 47, fig. 12 n., 20 l-m. (1904). — Robinson & Fernald, Gray's New Man. 327, fig. 665 (1909). — *S. incana* Michaux, Fl. Bor.-Am. ii. 225 (1803), non Schrank (1789). — *S. Mühlenbergiana* Willdenow, Sp. iv. 692 (1805), pro parte, quoad *S. incana* Mchx. — ? *S. candida* β *rugosa* Richardson in Franklin, Narr. Jour. Pol. Sea, Bot. App. 753 (1823); reprint, p. 25; ed. 2, 765 (1823); reprint, p. 37. — *S. candida* α , *tomentosa* Andersson in De Candolle, Prodr. xvi.² 278 (1868). — ? *S. tristis minor* Andersson in Svensk. Vet.-Akad. Handl. vi. 113 (Monog. Salic.) (1867). — ? *S. tristis* β *nivea* Andersson in De Candolle, Prodr. xvi.² 237 (1868). — *S. candidula* Nieuwland in Am. Midl. Nat. iii. 225 (1914).

This well known species has been described by Flüggé apud Willdenow without indicating the native country or the name of a collector. Nevertheless the description is quite sufficient. Michaux described it first as *S. incana* from Canada "juxta lacum S. Joannis" but he used a name already applied years before to a European species to which the name *S. Elaeagnos* Scopoli is referred by Koehne and other authors. Koehne placed *S. candida* in the same group with *S. incana* but the latter has more or less united filaments which are pubescent, yellowish bracts with short hairs, and glabrous ovaries while in *S. candida* the filaments are free and glabrous, the bracts brownish or bicolor with long hairs, and the ovaries are densely tomentose. There are other differences too between the two species which can by no means be regarded as even distantly related to each other. The true affinity of *S. candida* is very doubtful. It has been placed with many different species as may be seen by the synonymy of the section as quoted above. I am, however, not convinced that any of the authors have put it in its right place, therefore I hold to my view that *S. candida* represents a section of its own. Its main character is the distinct opace tomentum which may be called pseudofarinaceous or floccose. This character combined with the habit, the more or less linear shape of the rugulose leaves, the brownish bracts, the young purplish anthers, and the mostly purpurascenscent or reddish styles and stigmas makes *S. candida* one of the most peculiar of Willows. From the species of Sect. *Glaucæ* it chiefly differs in the absence of a second gland in the male flowers.

All the characters of *S. candida* are very constant, only the shape of the leaves varies to a certain degree in the more northern specimens. Andersson distinguished a var. *tomentosa* which is nothing but the type and a var. *denudata*. The identity of this is rather difficult to determine because Andersson did not cite a type nor a locality. He only said: "foliis supra glabrescentibus subaequalibus subtus tomento rariori vel obsoleto fere virescentibus vel etiam glaucescentibus." It is possible that Andersson had before him one of the frequent hybrids of *S. candida*. I adopt, however, the view taken by Fernald who gives the name var. *denudata* to all those forms with glabrescent or almost glabrous mature leaves which in pubescence or in floral characters cannot be separated from typical *S. candida*. There are some forms of the Gaspé Peninsula with long fruiting aments which probably represent another variety not identical with var. *denudata*.

Richardson's *S. candida* β *rugosa*, the type of which came from the Northwest Territories is an uncertain form. His statement "foliis . . . exstipulatis" points to a species different from *S. candida*. I have not yet had an opportunity to see the type specimen. Andersson's form of *S. tristis* mentioned in the synonymy is likewise very doubtful, and may represent a hybrid with *S. candida*.

The Hoary Willow is a species usually found in cold bogs and Tamarack swamps, where it may be recognized at once by its stiff habit and by its

foliage. I have seen specimens of typical *S. candida* from the following states and counties or localities.

UNITED STATES. New Jersey (Morris County); Pennsylvania (nothing seen but recorded from Luzerne and Pike Counties); New York (Tompkins, Madison, Oneida, Herkimer, Wayne, Erie, and St. Lawrence Counties); Connecticut (Litchfield County); Massachusetts (Essex and Berkshire Counties); Vermont (Rutland and Caledonia Counties); Maine (apparently wanting; it is mentioned in the Portland Cat. No. 933, but what I have seen in Herb. G. is *S. pellita*); Ohio (Erie County; according to Kellerman & Werner central and northern Ohio); Indiana (Lagrange, Noble, Steuben and Lake Counties); Michigan (Keweenaw, Calhoun, Ingham, Mackinac and Emmet Counties); Wisconsin (Door, Racine and Dane Counties); Minnesota (Hennepin County); Illinois (Peoria, Winnebago, McHenry and Cook Counties); Iowa (Cerro, Gordo and Winnebago Counties) North Dakota (Benson County); Colorado (locality uncertain, leg. *Hall & Harbour*, 1862, Rocky Mts. Lat. 39–41°, No. 173, st.; G.; in C. sheet 6275); Wyoming (Albany County, Centennial, *A. Nelson*, Nos. 1755 and 8684; the first is an offshoot, the last a fruiting specimen); Montana (Flathead County; Columbia Falls, Rost Lake, Big Fork, Swan Lake; Teton County; near Cutbank Creek).

CANADA. British Columbia (? Caribou District, Telegraph Trail, Lat. 54, June 8, 1858, *J. Macoun*, No. 1640 ex parte, m., f.; G.); Alberta (Rocky Mts. District: Vicinity of Banff, swamp near Vermilion Lake, and Kananaskis, along the Bow River); Northwest Territories (Great Slave Lake, low island about 3 miles west of Rocher River, August 19, 1914, *F. Harper*, fr.; O.); Saskatchewan (Cumberland House, *Richardson*, 1825, st.; N.); Manitoba (Winnipeg Valley, *Bourgeau*, Lake Winnipeg, *Richardson*, and Hudson Bay at Churchill, *J. M. Macoun*); Ontario (Thunder Bay and Lambton Districts); Quebec (Saguenay nearest to Labrador, Mingan Islands, Anticosti, and Gaspé, Bonaventure, Matane, Two Mountains Districts and Temiscaming); New Foundland (Bay of Islands, St. Paul Bay, Ingornachoix Bay); Labrador (Forteau, Blanc Sablon); New Brunswick (Gloucester County, Magdalen Islands).

To var. *denudata* Andersson I refer the following specimens:

NEWFOUNDLAND. Ingornachoix Bay, wet runs and boggy spots in limestone barrens, near sea-level, August 4, 1910, *Fernald & Wiegand* (No. 3184, st.; G.); Silurian Coastal Region north of St. Paul's Bay, Cow Head, conglomerate limestone and calcareous sandstone cliffs and ledges, July 12, 1910, *Fernald & Wiegand* (No. 3183, fr.; G.).

QUEBEC. Mouth of Grand River, Gaspé County, June 30, 1904, *M. L. Fernald* (m., fr.; G.; the size of the fruiting aments is very variable; they measure from 3.5:1.3 up to 8.5:1.5 cm.; the old leaves are shown in the following specimens; in some specimens even the young leaves are very glabrous); same place, open bogs, August 11–15, 1904, *Collins, Fernald & Peace* (No. 4897, st.; G.; "with the type"); Tourelle, mouth of River St. Anne des Monts, in springy bogs, August 19–21, 1905, *Collins & Fernald* (st.; G.).

ONTARIO. Along railway east of Carp, Carleton County, May 17, 1913, *J. M. Macoun & M. O. Malte* (No. 87768, O., f.)

WISCONSIN. Sheboygan County: Elkhart Lake, June 29, 1879, *J. H. Suetter*, (st.; G.). Milwaukee County: Milwaukee, wet meadows, May, 1841, *I. A. Lapham* (f., st.; G.).

NEW YORK. Tompkins County: Ithaca, Fleming Meadow, April 30, May 17, September, 1895, *Rowlee & Wiegand* (Nos. 33, f., st.; G., St.).

NEW JERSEY. Morris County: Budd Lake, swamps, local, May 13, 1906, *K. K. Mackenzie* (No. 1966, f.; M.; amentis crassis laxifloris).

c. SALIX WOLFII BEBB AND ITS SYSTEMATIC POSITION

When Bebb described this interesting species he said of its possible affinity: "Resembles the foregoing [*S. Novae-Angliae*, Anders., var. *pseudocordata* And.] in habit and in the form of the leaves and aments, but distinguished by the perfectly smooth, reddish capsules, the black, scantily villous scales, and the leaves colored alike on both sides; aments somewhat as in *S. Novae-Angliae*, var. *pseudo-myrsinites* And., but that has beaked capsules and glabrous, crenate leaves, which are membranous in texture and prominently reticulate-veined." The forms to which Bebb alludes belong to sect. *Cordatae*, but *S. Wolfii* cannot be united with this section on account of the presence of a dorsal gland in the male flowers, the sessile or subsessile ovaries and capsules, and other minor characters which distinguish it widely from all the species of the *Cordatae*-group. There are, however, two Mexican species, *S. Hartwegii* Bentham and *S. mexicana* v. Seemen with which I have dealt in Bot. Gaz. LXV. 28 (1918), which have such dorsal glands, and in the structure of the female flowers much resemble the species of the *Cordatae*. To this group *S. Hartwegii* is usually referred, but I am of the opinion that the two Mexican Willows represent a distinct section which may be regarded as somewhat intermediate between the *Cordatae* and the group to which *S. Wolfii* belongs. This is, of course, no definite statement, because we are still far from having more than a rather vague idea of the true relationship of a good many of the American Willows. I think it best not to unite species of apparently no close affinity in the same group but to propose some new sections for those forms which show good characters of their own. *S. Wolfii* is a species which I cannot refer to any group of species of America or of the Old World. I do not, however, at present propose a new section for it, I only wish to signify its peculiar position. Ball referred it to his section *Commutatae* in 1909, but as I have already explained on p. 148 under sect. *Adenophyllae* I do not think that it can be placed with the species of that group on account of the dorsal gland in the male flowers.

S. Wolfii Bebb apud Rothrock in Wheeler, Rep. U.S. Geogr. Surv. West 100. Merid. VI. Bot. 241 (1878). — Rydberg in Bull. N.Y. Bot. Gard. 1. 276 (1899); Fl. Rocky Mts. (1917). — Ball apud Coulter & Nelson, New Man. Rocky Mts. Bot. 134 (1909). — The type was collected by Wolf & Rothrock, No. 280, in South Park, Colorado. I have seen all the specimens cited by Bebb, and I give the following description because Bebb's diagnosis is rather short and needs some additions. Frutex parvus erectus, fide Tidestrom ad 1 m. altus, breviter et dense plus minusve divaricato-ramosus ramis vix ad 6 mm. crassis; ramuli novelli subdense tenuiter breviterque sericeo-villosuli, hornotini flavescens vel in sicco saepe nigrescentes, annotini paullo laxius villosuli (rarius glabrati), flavo-brunnei vel brunnescentes, circiter 1–1.5 cm. crassi, biennes vetustioresque brunnei vel fere atro-brunnei, saepe subnitidi, plerique glabri vel subglabri, demum epidermide flavescens solubili sordide fuscescentes. Gemmae bene

evolutae ovoidae, obtusiusculae, circ. 5 mm. longae, ut ramuli hornotini pilosae et coloratae. Folia adulta firma sed tenuia, minora inferiora plusminusve oblanceolata vel spathulata, saepissime apice obtusa vel fere rotundata, circ. 8:3 ad 20:6-7 mm. magna, normalia superiora oblanceolata, elliptico-lanceolata vel saepissime rhomboideo-oblanceolata, basi subito sensimve cuneata, apice acuta vel breviter acuminata, 2.5:0.6 ad 3.8 : (vel ad 4:1.3) cm. magna, omnia integerrima, rarius infima tenuiter denticulata, superne initio plusminusve dense adpresse breviter argenteo-sericea, submicantia, adulta glabriora sed saepissime tantum infima minima satis glabrata, cano-viridia, costa nervisque lateralibus utrinque 4-5(-6) angulo valde acuto a costa abeuntibus et marginem subparallelibus ad apicem currentibus vix vel paullo visibilibus, epidermide ut subtus stomatifera; subtus plusminusve ut superne pilosa, colorata et nervata, magis glabrescentia, costa leviter prominente; petioli (1-)2-5(-6) mm. longi, superne sulcati et villosuli, subtus glabri vel subpilosi; stipulae nullae vel minimae, ovato-rotundae, tenuiter glanduloso-fimbriatae, vix ultra 1 mm. longae. Amenta plusminusve coetanea, parva, elliptica, densiflora, pedunculis 1-4 mm. longis foliola parva lanceolata vix ultra 1:0.4 cm. magna superne fere glabra subtus plusminusve sericea gerentibus suffulta; mascula circiter 5-12 (-18):5-8 mm. magna, pedunculo excluso; bractee obovato-oblongae, apice rotundatae, atrofuscae, tenuiter sericeo-villosae (pilis quam bractee circiter $\frac{1}{2}$ vel $\frac{1}{3}$ brevioribus), vix ultra 2 mm. longae; stamina 2, filamentis tenuibus liberis glabris bracteam demum $2\frac{1}{2}$ -plo superantibus, antheris minimis subglobosis flavis; glandulae 2, ventralis ovato-rectangularis truncata quam bractea $\frac{1}{3}$ ad $\frac{1}{2}$ -plo brevior, dorsalis saepissime minor et filiformis, saepe minima; amenta feminea sub anthesi circiter ad 1:0.6 mm., fructifera ad 2.5:1 mm. pedunculo excluso magna, densa; bractee ut in floribus masculis; ovaria anguste ovoideo-conica, glabra, rariter basi id est pedicello brevissimo sparse pilosa, subsessilia; glandula 1, ventralis, ut in masculis, vel angustior; styli breves sed distincti, 0.5-1 mm. longi, apice interdum subbifidi, stigmatibus minimis bifidis divaricatis ad 3-plo longiores; fructus maturi rufescentes circiter 4.5-5 (-5.5) mm. longi, e basi ovoideo-rhomboidali conico-subrostrati pedicello brevissimo glandulam 2-3-plo brevioris excluso.

The following specimens of typical *S. Wolfi* have been examined.

COLORADO. Dolores County: Rico, 3000-3250 m., July 1, 1909, coll.? (No. 2340, Pl. of Colo.; fr.; N.). ? Pitkin County: Elk Mountains, Mt. Baldy, about 3900 m., July 11, 1891, *E. C. Smith* (m., f.; M.); Lake County: Leadville: bank of stream, 3300 m., June 25, 1916, *F. W. Clokey* (No. 2669, fr.; C.); Tennessee Pass, 3500 m., June 24, 1893, *De Alton Saunders* (m., d.; N.). Park County: Mosquito Pass, 3500 m., September 4, 1898, *J. G. Jack* (st.; A.); South Park, 1873, *J. Wolf* (m., f.; N., W.); same locality, June, 1873, *J. Wolf* & *J. T. Rothrock* (No. 820, m., f.; type in C. [sheet 305647] co-type in G.; No. 828, m., f.; G.; same in W. sub No. 372 mixed with *S. monticola*). ? Jefferson County: South Platte (or on Platte River in Park County), June, 1873, *Wolf* & *Rothrock* (No. 824, m., f.; C., G.; No. 827, m., f.; G.). Gilpin County: Eldorado to Baltimore, about 2800 to 3200 m., June 20, July 10, 1903, *F. Tweedy* (No. 5604, fr. im.; N.). Larimer County: Camp Creek, swampy land, July, 1903, *L. N. Goodding* (No. 1463, f. adult.; Cor., G.

M., N., W.; ovarii ex parte pilosis ad var. *idahoensem* spectans); Berthoud Pass, west slope, July 29-30, 1918, *D. M. Andrews* (No. 28, st.; A.; ut praecedens). Jackson County: on Grizzly Creek, alt. 2800 m., July 24, 1896, *C. F. Baker* (Rowlee Nos. 11, 12, and 13; st.; M., N.); ? same County, North Park, May 31, 1898, *G. E. Osterhout* (No. 1585, m., f.; N.) ? La Plata County: Vicinity of Mt. Carbon, along creek, alt. 900 m., July 15, 1910, *J. Tidestrom* (No. 3670, fr.; W.; "shrub 1 m. high; fructibus glabris, foliis ut in var. *idahoensi*"); Mt. Carbon, June, 1909, *N. L. T. Nelson* (No. 55, fr.; N.); Eagle County: Wolcott, *A. Eastwood* (m., C. sheet 457948). Routt County: Flat Top Mts., June, 1891, *A. Eastwood* (No. 19, m., f.; C.). ? County: without exact locality and date, *Hall & Harbour* (f.; sheet 367360 in C.)

WYOMING. Albany County: Medicine Bow Mts., Nash's Fork, July 28, 1900, *A. Nelson* (No. 7780, f.; Cor. G., N., W.); Wood's Creek, August 11, 1896, same coll. (No. 2079, st.; Cor.). Fremont County: Wind River, 1873, *C. C. Parry* (No. 263, m., f.; C., G.). Sheridan County: Bighorn Mts., Headwaters of Tongue River, July, 1898, *F. Tweedy* (No. 88, fr. juv.; N.); same place, about 3050 m., July 13, 1900, *J. G. Jack* (fr.; A.); Piney and Beaver Creeks, alt. 1000 m., July 22, 31, 1900, *C. C. Curtis* (fr.; N.). Lincoln County: Teton Forest Reserve, Buffalo Fork, about 3200 m., August, 1897, *F. Tweedy* (No. 297, fr.; N.); Jackson's Hole, common on low grounds near Gros Ventre River, July 15, 1901, *Merrill & Wilcox* (No. 941, fr. submat.; C., G., M., N., W.). Yellowstone Park: Swan Lake Flat, July 9, 1902, *E. A. Mearns* (No. 1666, f.; N.; in W. ad var. *idahoensem* vergens); same locality, June 9, July 9, 1902, *E. C. Smith* (m., f.; fr.; C.); without exact locality, July 13, 1902, *Mearns* (No. 1833, fr.; W.); Mammoth Hot Springs, abundant in extended patches on low flats, July 3, 1899, *A. & E. Nelson* (No. 5655, f.; G., M.; in W. determined var. *idahoensis* by Ball); Norris Geyser Basin, September 7, 1904, *A. Rehder* (st.; A.); same place and date, *J. G. Jack* (st.; A.).

There has been described by Ball a *S. Wolfii* var. *idahoensis* in Bot. Gaz. XL. 378 (1905); apud Coulter & Nelson, New Man. Rocky Mts. Bot. 134 (1909), which Rydberg (Fl. Rocky Mts. 197 [1917]) made a species *S. idahoensis*. It has been named *S. glauca* var. *villosa* by various authors dealing with the flora of the Rocky Mountains, and I have found it in different herbaria under the name *S. Cusickii* Rowlee which so far as I know has never been published. Ball said about var. *idahoensis*: "The relationships of this little willow are all with *S. Wolfii* Bebb, from the typical form of which it differs mainly in the silky-pubescent capsule and the rather more silky leaves. The different specimens show considerable variation in the amount of pubescence on the capsules, in general, the specimens from the northwestern localities, show the denser pubescence, both on leaves and capsules. In some cases they tend toward a glabrate condition in age. In *S. Wolfii* the capsules are glabrous even when young. This variety is found from the Yellowstone Park northwestward across Montana and Idaho to eastern Oregon. The species is found from central Colorado to Montana and Idaho."

After having examined the material cited below, I may state that var. *idahoensis* seems to differ from typical *S. Wolfii* chiefly by the following characters: gemmae magis conicae, ad 9 mm. longae, atrobrunneae; folia infima minima saepius subtiliter glanduloso-denticulata, majora superiora lanceolata, oblanceolata vel elliptico-lanceolata, apice obtusa ad rotunda, basi saepissime sensim acute, 2.5:0.6 ad 5(-6):1.5(-2) cm. magna, utrinque,

saltem initio, dense adpresse argenteo-sericea, dein plusminusve cinereo-viridia, paullo vel distinctius glabriora, petioli ad 7–10 mm. longi; stipulae in ramulis vegetioribus ad 5 mm. longae, semi-ovato-lanceolatae, acutae, dense glanduloso-(subfimbriato-)denticulatae; amenta (mascula nondum visa) feminea ad 3:1.2 cm. magna pedunculo brevi folia ad 3 satis normalia gerente excluso; ovaria plusminusve dense sericeo-villosula vel satis glabrescentia, sessilia vel subsessilia; styli 1–1.25 mm. longi, bractee interdum plusminusve flavo-brunneae (an formae hybridae?) fructus 4–5 mm. longi.

After all var. *idahoensis* hardly represents more than a vigorous variety of *S. Wolfii* with pubescent capsules. Tidestrom's No. 3670 has glabrous fruits, but leaves like var. *idahoensis*, for which it is taken by Ball. On the other hand in *S. Wolfii* the ovaries are not always entirely glabrous as I said in the description given above. There may be forms of hybrid origin, and some forms of the *Cordatae* which hitherto have been referred to *S. pseudo-myrsinites* or *S. pseudocordata* by Ball and Rydberg are often very similar to var. *idahoensis* at least when without fruit and in leaf only.

The following specimens seem to belong to this variety:

IDAHO. Elmore County: Trinity Lake region, wet meadows, August 27, 1910, *J. F. Macbride* (No. 638, fr.; G.; "low clumps"). Blain County: Forks of Wood River, alt. 1800 m., July 25, 1895, *L. F. Henderson* (No. 3399, type; W.). Fremont County: Upper Teton Canyon, 1872, *J. M. Coulter* (st.; W.; forma incerta) fr.

WYOMING. Teton Forest Reserve, Sheep Mt., August, 1879, *F. Tweedy* (No. 293, f., fr.; N.). Without locality, along mountain brook, near camp 11, August 19, 1893, *J. N. Rose* (No. 404, ex parte; f.; W.; mixed with fruiting specimen representing probably a hybrid of this variety). Yellowstone Park: Head of Swan Lake Valley, July 9, 1888, *F. H. Knowlton* (fr.; C., W.); borders of ponds, July 6, 1894, *J. H. Burglehaus* (No. 12, fr., C.); without locality, Sylvan Lake, 1911, *C. A. Reynolds* (st.; C.); September 5, 1904, *J. G. Jack* (st.; A.); Indian Creek, June, 1881, *F. Tweedy* (No. 481, f.; W.); about 2300 m., common, July, 1896, *C. S. Sargent* (fr. im.; A.); Lincoln Gulch, August 12, 1796, *A. Nelson* (2596a; st.; A.); August 16, 1903, *E. A. Mearns* (No. 3364, fr.; W.); East de Lacy's Creek, 2500 m., August 10, 1897, *Rydberg & Bessey* (Nos. 3916, st. 3961a st.; N., forma porro observanda); Lewis River, common, August 9, 1899, *A. & E. Nelson* (No. 6387, fr.; G., N.; "in clumps, 0.9 to 2.1 m., high"); Red Mts., Yellowstone Lake, 1872, *J. M. Coulter* (Hayden Survey, fr., W.).

MONTANA. Gallatin County: lower basin of the Gallatin, marshy places, 2150 m., July 7, 1898, *J. W. Blankinship* (fr.; Cor.; shrub); Bald Mt., July 21, 1880, *S. Watson* (No. 372 b.; f., m.; G.; forma satis incerta) floribus masculis una tantum glandula instructis.

OREGON. Wallowa County: bank of Wallowa River, mouth of Hurricane Creek, June 11, 1900, *W. C. Cusick* (No. 2400, f.; C. G., Jepson, N. M., W.; distributed as *S. Cusickii* Rowlee); near Lostine, June 18, 1907, *F. V. Coville* (No. 2433, fr. W.; "in a wet gravelly bottom growing with *Betula glandulosa*").

VIENNA, January, 1920.